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Final Report: DURIP: Electrokinetic Injection and Separation System for Analysis of Protein and Peptide Transport, Adsorption and Kinetics Instrumentation Proposal

5a. CONTRACT NUMBER
W911NF-13-1-0263

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER
611103

6. AUTHORS
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5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAMES AND ADDRESSES

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13. SUPPLEMENTARY NOTES

The views, opinions and/or findings contained in this report are those of the author(s) and should not contrued as an official Department of the Army position, policy or decision, unless so designated by other documentation.

14. ABSTRACT

We requested equipment necessary to build an electrokinetic injection and separation system for the analysis of protein and peptide transport, adsorption and kinetics as well as other biomolecular characterization as prescribed by our current Army contracts. Biomolecular, and more specifically proteomic, analyses are vital for fully understanding biological systems. Under a recent PECASE grant awarded to the PI, we are investigating fundamental protein transport, adsorption, and kinetic interactions using a novel nanofluidics-based platform. Since nanofluidic channels are on the same length scale of both the electric double layer that forms at a solid-liquid

15. SUBJECT TERMS

electrokinetic, peptide transport, adsorption, darkfield, nanofluidics

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a. REPORT	b. ABSTRACT	c. THIS PAGE			Sumita Pennathur
UU	UU	UU	UU		19b. TELEPHONE NUMBER: 805-893-5510

Report Title

Final Report: DURIP: Electrokinetic Injection and Separation System for Analysis of Protein and Peptide Transport, Adsorption and Kinetics Instrumentation Proposal

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We requested equipment necessary to build an electrokinetic injection and separation system for the analysis of protein and peptide transport, adsorption and kinetics as well as other biomolecular characterization as prescribed by our current Army contracts. Biomolecular, and more specifically proteomic, analyses are vital for fully understanding biological systems. Under a recent PECASE grant awarded to the PI, we are investigating fundamental protein transport, adsorption, and kinetic interactions using a novel nanofluidics-based platform. Since nanofluidic channels are on the same length scale of both the electric double layer that forms at a solid-liquid interface as well as the biomolecules themselves, we can harness the coupled physics of complex biological fluids in nanofluidic channels towards unique, efficient technology that will potentially allow for a truly new regime of proteomic analysis. Specifically, we bought an instrument that helps us validate our characterization instrument, the equipment needed for our system itself, and a variety of corresponding parts that accompany the equipment in order to allow us to operate with real human samples, with whole blood and in darkfield conditions.

Enter List of papers submitted or published that acknowledge ARO support from the start of the project to the date of this printing. List the papers, including journal references, in the following categories:

(a) Papers published in peer-reviewed journals (N/A for none)

Received	Paper

TOTAL:

Number of Papers published in peer-reviewed journals:

(b) Papers published in non-peer-reviewed journals (N/A for none)

Received	Paper

TOTAL:

Number of Papers published in non peer-reviewed journals:

(c) Presentations

Number of Presentations: 0.00

Non Peer-Reviewed Conference Proceeding publications (other than abstracts):

Received Paper

TOTAL:

Number of Non Peer-Reviewed Conference Proceeding publications (other than abstracts):

Peer-Reviewed Conference Proceeding publications (other than abstracts):

Received Paper

TOTAL:

Number of Peer-Reviewed Conference Proceeding publications (other than abstracts):

(d) Manuscripts

Received Paper

TOTAL:

Number of Manuscripts:

Books

Received Book

TOTAL:

Received Book Chapter

TOTAL:

Patents Submitted

Patents Awarded

Awards

Graduate Students

NAME	PERCENT_SUPPORTED

FTE Equivalent:
Total Number:

Names of Post Doctorates

NAME	PERCENT_SUPPORTED

FTE Equivalent:
Total Number:

Names of Faculty Supported

NAME	PERCENT_SUPPORTED	National Academy Member
Sumita Pennathur	0.00	
FTE Equivalent:	**0.00**	
Total Number:	**1**	

Names of Under Graduate students supported

NAME	PERCENT_SUPPORTED
FTE Equivalent:	
Total Number:	

Student Metrics

This section only applies to graduating undergraduates supported by this agreement in this reporting period

The number of undergraduates funded by this agreement who graduated during this period: 0.00

The number of undergraduates funded by this agreement who graduated during this period with a degree in science, mathematics, engineering, or technology fields:..... 0.00

The number of undergraduates funded by your agreement who graduated during this period and will continue to pursue a graduate or Ph.D. degree in science, mathematics, engineering, or technology fields:..... 0.00

Number of graduating undergraduates who achieved a 3.5 GPA to 4.0 (4.0 max scale):..... 0.00

Number of graduating undergraduates funded by a DoD funded Center of Excellence grant for Education, Research and Engineering:..... 0.00

The number of undergraduates funded by your agreement who graduated during this period and intend to work for the Department of Defense 0.00

The number of undergraduates funded by your agreement who graduated during this period and will receive scholarships or fellowships for further studies in science, mathematics, engineering or technology fields: 0.00

Names of Personnel receiving masters degrees

NAME
Total Number:

Names of personnel receiving PHDs

NAME
Total Number:

Names of other research staff

NAME	PERCENT_SUPPORTED
FTE Equivalent:	
Total Number:	

Sub Contractors (DD882)

Inventions (DD882)

Scientific Progress

See attachment

Technology Transfer

DURIP

Final Report

Grant title: DURIP- Electrokinetic Injection and Separation System for Analysis of Protein and Peptide Transport, Adsorption and Kinetics Instrumentation Proposal

Principal Investigator: Sumita Pennathur, PhD.

Equipment acquired

1) Mobius Analytical Instrument for Particle Analysis (Wyatt Inc.)
2) Nanodrop Spectrophotometer (Fisher, Inc.)
3) Olympus microscope (Olympus, Inc.)
4) Vibration isolator (Newport, Inc.)
5) Biosafety Cabinet (Nuaire, Inc.)
6) pH and conductivity meter (Oakton, Inc.)
7) Laptop/keyboard for the equipment (Dell, Inc. and CDWG)
8) Stirplate/hotplate (Fisher, Inc.)
9) EQ lab oven (VWR International)

Total cost: $169,107.53

Special circumstances regarding the acquisition:

None

Ongoing and proposed research:

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dedicated to this PECASE project, but also two other Army-related grants, as well as any other follow-on funding. This will allow for data to be obtained at much higher throughput, and allow for breakthrough results in peptide and protein transport, adsorption and kinetics. In particular, we are modifying the system to be able to not only allow for label-free results, but also better sensitivity and resolution than our current setup, allowing for unprecedented measurements on the molecular scale.

Patents filed:

None